



# minnesota department of health

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5/4/66

October 28, 1981

Michael Kosakowski (WH-527M)  
U.S. Environmental Protection Agency  
Office of Waste Program Enforcement  
Room 1123  
401 M Street SW  
Washington, D.C. 20460

Dear Mr. Kosakowski:

It has been several weeks since our telephone conversation about the need for additional studies of possible health effects of PAH exposure in St. Louis Park. It was not clear whether or not you and Dr. Wagner had access to all the available information on the studies centering around 1969-71 TNCS data. Enclosed is the Minnesota Medicine article which you undoubtedly have, and the only other "published" material, from our Newsletter, which describes the followup interview study of 80 breast cancer cases and 80 disease-matched controls. We are of course very interested in hearing your ideas or plans for further studies, and in having a chance to comment on these.

Our study centered on the years 1969-71 because the TNCS data had already been collected at a cost of approximately \$600,000. We did apply to the EPA for a modest amount of money to do further studies two years ago and this was not approved. There is no guarantee that those three years were the best years to study, since exposure levels are not well established for any time period before 1978. Further incidence studies, if they could be done at reasonable cost and with solid scientific design, would be quite welcome.

Our last conversation concluded with the indication that either you or Dr. Wagner would be getting back to me to continue the discussion about further St. Louis Park studies. We would, of course, like to be involved in the development and discussion of any studies that are proposed.

The Department of Health has many concerns relative to the design and execution of any study within the state. The major concern, is, of course, the protection of the public health and the continued identification of problem areas. To this end, the Health Department in concert with the State Legislature is exploring designs for a statewide cancer surveillance system. A pilot study of the system using St. Louis Park might be able



to satisfy several objectives. We are currently in the process of developing ideas and locations for pilot testing. If a study is already ongoing in St. Louis Park using traditional hospital based methods, this would provide an opportunity to compare the results with an innovative method for case ascertainment.

I look forward to our continued communication.

Sincerely yours,

*Andrew G. Dean, M.D./eb*

Andrew G. Dean, M.D., M.P.H., Director  
Div. of Disease Prevention and Control

:lmb

Enclosures

xc: Mike Convery, Public Water Supply  
Roger DeRoos, Environmental Health  
Jack Mandel, University of Minnesota

# DISEASE CONTROL NEWSLETTER

MINNESOTA DEPARTMENT OF HEALTH • 717 DELAWARE STREET SE • MINNEAPOLIS, MN 55440 • (612)296-5414

Volume 8, Number 1

January-February 1981

## HIGH BREAST CANCER RATES IN ST. LOUIS PARK EXPLAINED

In a study reported here a year ago,<sup>1</sup> St. Louis Park, Minnesota was found to have rates 45% higher than those for surrounding communities. The study was prompted by concern about the discovery in 1978 of small but detectible amounts of Polynuclear Aromatic Hydrocarbon (PAH) compounds in the St. Louis Park public water supply. Records from the Third National Cancer Survey, which included abstracts of hospital records from 1969-71 for all cancer patients in the five-county Twin City metropolitan area, were used to compare cancer rates for St. Louis Park and the remainder of the metro area. Rates were calculated for 45 different types of cancers. Breast cancer and, to a lesser extent, gastrointestinal cancer in women had higher rates in St. Louis Park.

Because rates for these cancers are influenced by a number of factors related to lifestyle and personal history, the reason for the difference in rates could not be determined at that time. The role of the PAH contamination in the municipal water supply was left in doubt.

During the past year, interviews have been conducted with two groups of breast cancer patients, 75 from St. Louis Park and 75 from the rest of the metropolitan area. Differences were found between the two groups with regard to the prevalence of known risk factors for breast cancer, and these differences are sufficient to explain the higher breast cancer rates in St. Louis Park.

The higher prevalence of risk factors like higher income, Jewish ethnic background and family history of breast cancer or fibrocystic disease in St. Louis Park cases, and of protective factors like early childbearing in the rest of the metro area population, account for most of the difference.

The interviews showed, for example, that 25% of cases in St. Louis Park were Jewish, compared with 3% of the other group. Studies in the medical literature indicate that there is about 1.35 times more breast cancer in Jewish populations than among other white women in the U.S. (Relative Risk of 1.35). This factor alone would account for breast cancer rates in St. Louis Park being 6.6% above those for a community having no Jewish population, or about 5.9% above those for the metro population. The risk factors and relative risks (RR) used in the calculations are displayed in the table below, along with the prevalence of each factor among the St. Louis Park and metro patients. By calculating the "attributable risk factors"  $[(RR-1/RR) \times [Prevalence\ of\ Factor]]$ , it is possible to conclude that differences between breast cancer rates in St. Louis Park and the metro area are very close to that predicted by the frequencies of risk factors in cases in the two populations. Using this method, there is no residual difference in rates which could be attributed to other possible risk factors such as exposure to PAH in the St. Louis Park water supply.

PAH contamination of the water in St. Louis Park has been attributed to creosote contamination of the soil at a 100 acre site formerly occupied by a wood treatment plant. The facility was operated by the Reilly Tar and Chemical Company from 1917 to 1972, and the site was later acquired by the City of St. Louis Park. Five of the 14 municipal water wells in St. Louis Park have been closed since 1978, and means to prevent or remove further contamination are being discussed.

Chemicals known to cause cancer in laboratory animals are being discovered with increasing frequency in water supplies throughout the U.S., as laboratory methods for analyzing water improve and are applied more widely. In Pennsylvania, for example, at least 35 public and private wells in Bucks and Montgomery counties have been reported to contain trichloroethylene, a potentially hazardous chemical. So far, studies have not shown that such exposure can cause cancer in humans. Because of the long period required for cancer to develop, and the many difficulties associated with measuring cancer rates in small or shifting populations, decisions about cleaning up contamination must be based primarily on laboratory evidence.

The new St. Louis Park results do not establish that the level of PAH compounds found two years ago is "safe". They do provide a reasonable explanation not related to the water supply for the high rates of breast cancer in the 1969-71 study. Creosote and PAH contamination of drinking water is not desirable, and a solution to the St. Louis Park problem will continue to be sought, despite the lack of evidence linking the contamination with actual cases of human cancer.

(continued)

## Breast Cancer (continued)

| Risk Factor   | Relative Risk | % of St. Louis Park Cases with Factor | % of Metro Cases with Factor |
|---|---------------|---------------------------------------|------------------------------|
| Age at first birth < 20 <sup>2</sup>                  | 0.32          | 1.3                                   | 5.3                          |
| Age at first birth 20-24                              | 0.55          | 25.3                                  | 34.7                         |
| Age at first birth 25-29                              | 0.76          | 25.3                                  | 24.0                         |
| Age at first birth 30-34                              | 0.90          | 18.7                                  | 12.0                         |
| Age at first birth ≥ 35                               | 1.17          | 8.0                                   | 1.3                          |
| Surgical menopause < 35 <sup>3</sup>                  | 0.36          | 0.0                                   | 2.9                          |
| Surgical menopause 35-49                              | 0.68          | 5.5                                   | 10.1                         |
| Surgical menopause ≥ 50                               | 0.98          | 2.7                                   | 4.3                          |
| Natural menopause < 46 <sup>4</sup>                   | 1.55          | 58.2                                  | 48.4                         |
| Previous breast cancer <sup>5</sup>                   | 4.50          | 6.8                                   | 10.8                         |
| Fibrocystic disease <sup>6</sup>                      | 2.80          | 21.9                                  | 17.8                         |
| 1st degree relative with breast cancer <sup>4,7</sup> | 2.2           | 21.3                                  | 14.7                         |
| Jewish <sup>8,9</sup>                                 | 1.35          | 25.3                                  | 2.7                          |
| Income quartile 1 (highest) <sup>10</sup>             | 0.96          | 44.6                                  | 33.3                         |
| Income quartile 2                                     | 1.03          | 20.0                                  | 17.4                         |
| Income quartile 3                                     | 0.87          | 21.5                                  | 23.2                         |
| Income quartile 4 (lowest)                            | 0.74          | 13.8                                  | 26.1                         |

Body weight and height are not shown, since their net effect was close to zero.

<sup>1</sup> Dusich K, Sigurdson E, Hall WN and Dean AG. MN Med 1980;63(11):803-6.

<sup>2</sup> MacMahon B, Cole P, Lin TM et al. Bulletin World Health Organization 1970;43:209-21.

<sup>3</sup> Trichopoulos D, MacMahon B, Cole P. J Nat. Cancer Inst 1972;48(3):605-13.

<sup>4</sup> Choi NW, Howe GR, Miller AB et al. Am J Epidemiol 1978;107(6):510-21.

<sup>5</sup> Schottenfeld D, Berg J. J Nat. Cancer Inst 1971;46(1):1610-70.

<sup>6</sup> Kodlin D, Winger EE, Morgenstern NL and Chen U. Cancer 1977;39:2603-7.

<sup>7</sup> Brinton LA, Williams RR, Hoover RN, Stegens NL, Feinleib M and Fraumeni JF. J Natl Cancer Inst 1979;62(1):37-44.

<sup>8</sup> Salber EJ, Trichopoulos D, MacMahon B. J Natl Cancer Inst 1969;43(5): 1013-1024.

<sup>9</sup> Newill VA. J Natl Cancer Inst 1961;26(2):405-17.

<sup>10</sup> Graham S, Levin M, Lilienfeld AM. Cancer 1960;13(1):180-91.

<sup>11</sup> Bain C, Speizer FE, Rosner B, Belanger C and Hennekens CH. Am J Epidemiol 1980;111(3):301-8.

## INFLUENZA IN MINNESOTA

Influenza virus was first isolated in mid-December from a patient at the University of Minnesota Hospitals. Since that time, a total of 28 isolates have been made. All isolates typed have been influenza A (H3N2), similar to the Bangkok strain. This is the same strain that has been identified by other states who have isolated influenza virus this year.

Influenza outbreaks have been reported from nursing homes and schools throughout the state. The outbreaks have been characterized by high attack rates and rapid onset, both common features of influenza outbreaks. As of January 9, four states have reported widespread influenza outbreaks and 13 have reported regional outbreaks. This indicates that a large amount of influenza is present and that it is likely that Minnesota will continue to experience influenza activity.

This year's vaccine formula contains antigen for the A-Bangkok flu along with A/H<sub>1</sub>N<sub>1</sub>/Brazil and B/Singapore. This should provide adequate protection to those who received the vaccine. Amantadine hydrochloride might also be considered for temporary prophylaxis in unvaccinated high-risk individuals (e.g., those with lung disease) during a definite epidemic.

# Minnesota Department of Health

## Cancer Rates in a Community Exposed to Low Levels of Creosote Components in Municipal Water

KARI DUSICH, M.P.H.;\* EUNICE SIGURDSON, R.N., M.P.H.†; WILLIAM N. HALL, M.D., M.P.H.‡;  
and ANDREW G. DEAN, M.D., M.P.H.¶

IN NOVEMBER, 1978, the Minnesota Department of Health detected minute (nanogram per liter) quantities of various polynuclear aromatic hydrocarbons (PAH), including pyrene, fluoranthene, anthracene, and naphthacene, in several municipal and industrial wells in the city of St. Louis Park, a suburb of Minneapolis<sup>1</sup>. Although there are no official U.S. standards for PAH in water supplies, four municipal wells were closed immediately because the amounts exceeded the World Health Organization's recommendation for safe levels in drinking water<sup>2</sup>. PAH compounds were not detected in the remaining ten municipal wells.

The PAH compounds apparently originated from the site of a plant which distilled coal-tar products and treated wood with creosote from 1917 to 1972. During this time, wastes from the plant's operations were deposited on the surface of the site, allowing contamination of the groundwater reservoirs below.

It is not known how long PAH compounds have been in the St. Louis Park water supply, since techniques for their detection in water have only been available in the past few years<sup>3</sup>. A well drilled in 1932, however, was shut down within a few months due to a creosote-like odor and taste of the water, and it is possible that PAH compounds have been in the municipal water for many years or decades in low concentrations.

The occurrence of PAH in the environment is of concern because of their demonstrated carcinogenicity for animals and/or mutagenicity for bacteria.<sup>4,9</sup> There appear to be no epidemiologic studies of human populations exposed to low levels of PAH in water supplies, although the association of occupational skin cancer with creosote and coal-tar compounds has long been known<sup>10,13</sup>.

The Minneapolis-St. Paul area, including St. Louis

Park, was part of the Third National Cancer Survey<sup>14</sup> conducted for the three years, 1969 to 1971. All hospital records in the five county Twin Cities area were searched for cancer diagnoses, and abstracts of cancer records were coded on computer tape. Because of the availability of these records on tape, albeit for a limited three year period of time, it was decided to compare cancer incidence rates in St. Louis Park with those in the nearby municipalities of Edina and Richfield and in the entire Minneapolis-St. Paul Standard Metropolitan Statistical Area (SMSA).

### Methods

Incidence rates for 45 types or sites of cancer were calculated for St. Louis Park, Edina, Richfield, and the Minneapolis-St. Paul SMSA using data from the Third National Cancer Survey for the three years, 1969-1971. Richfield was selected because it was a SMSA suburb similar to St. Louis Park in social and economic characteristics such as median school years completed, percent high school graduates, occupation and median and mean family income. Edina was selected because the creosote contamination was believed, at that time, to be moving toward Edina. The entire SMSA was used as the major comparison area. Incidence rates were age-adjusted to the SMSA populations of white males and white females respectively. Calculations were done of average annual age- and sex-specific cancer incidence rates, age-adjusted incidence rates, standard incidence ratios (SIR), Mantel-Haenszel overall summary Chi-squares<sup>15,16</sup> and Z statistics. The latter two statistics are used to assess the significance of the difference between two rates after adjusting for age. Population denominator data were taken from the 1970 U.S. Census<sup>17</sup>.

### Results

For males, no cancer rates in St. Louis Park were statistically significantly different from those in the three comparison areas. Among females, age-adjusted rates for all cancer sites combined, for breast cancer, and for cancers of the gastrointestinal tract were higher

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in St. Louis Park than in Edina, Richfield, and the SMSA. The excess in gastrointestinal cancer rates for females was only slightly significant ( $P < .05$ ) but all cancer sites combined and breast cancer had differences with a high degree of statistical significance ( $P < .0005$ ). Further details of the significant comparisons are given in the Table.

### Discussion

In the absence of epidemiologic literature on ingested exposure to PAH, it is of interest to note that rats fed one PAH compound — 3-methylcholanthrene — develop mammary carcinoma in high frequency and these tumors occur almost exclusively in females.<sup>18-20</sup> Other PAH compounds produce a variety of tumors in animals<sup>4</sup>.

Breast cancer rates vary considerably with geographic location and with characteristics of the population<sup>21,24</sup>. In the Third National Cancer Survey<sup>14</sup>, for example, the rates varied from 59 to 83 per 100,000 white females per year in the nine different study areas. In a recent review of the epidemiology of human breast cancer, Kelsey has summarized the influence of major factors known to influence breast cancer rates, expressing the results as relative risks (RR) — the ratio of case rates in a population with the factor to the rate in those without the factor<sup>24</sup>. These include: (1) First degree relative with breast cancer (RR of 2-4); (2) Absence of or late age at first full-term pregnancy (RR of 2-4); (3) History of fibrocystic disease of the breast (RR of 2-4); (4) Exposure to high levels of radiation to the chest (RR of 2-4); (5) Upper socio-economic class (RR of 2-4); (6) Obesity (RR of 2-4); and (7) Early age at menarche and late age at

menopause (RR of 1.1-1.9). Rates given in the literature for Jewish populations are contradictory, varying from less than to higher than those for non-Jewish whites<sup>25,27</sup>. The contribution of these factors to the difference in breast cancer rates between St. Louis Park and the comparison areas cannot be evaluated without further information about the individual cases. Because of the sizable population with Jewish ancestry, estimated to be 20% in 1971<sup>28</sup>, the influence of this factor is of particular interest, but would not explain the 1.5 fold difference in rates even if 20% of the St. Louis Park breast cancer cases were Jewish and a two-fold relative risk existed.

The lack of elevation in the rates for the great majority of cancer types is reassuring, but factors responsible for the elevation in breast cancer rates in St. Louis Park need to be investigated. Further interpretation must await interviews of the 95 cases of breast cancer or their families and an appropriate control group. The results of such a detailed case-control study, now in the planning phases, may explain the elevated breast cancer rates in St. Louis Park on the basis of the frequencies of known risk factors. If this is not the case, further studies to explore a possible relationship with the water supply must be considered.

At the present time, the elevated incidence of breast cancer cannot be attributed to the water contamination, although the limited information available does not rule out such an association. It should be noted that the wells found to be contaminated have been closed, presumably reducing any hazard which may have been present.

TABLE  
Cancer Incidence Rates for Total Cancers and Breast Cancer  
St. Louis Park and  
Three Comparison Populations  
White Females Only, 1969 to 1971

|                | Breast Cancer |                          |  | All Cancers    |  |
|----------------|---------------|--------------------------|--|----------------|--|
|                | Population    | Total Cases<br>1969-1971 | Average Annual<br>Age-Adjusted Rate*<br>per 100,000 pop. | Total<br>Cases | Average Annual<br>Age-Adjusted Rate*<br>per 100,000 pop. |
| St. Louis Park | 25,424        | 95                       | 113  | 301            | 381  |
| Edina          | 22,492        | 65                       | 82   | 175            | 241  |
| Richfield      | 24,247        | 41                       | 58   | 145            | 235  |
| MSP SMSA       | 914,218       | 2130                     | 78   | 7726           | 282  |

\*Rates per 100,000 white females, adjusted to the MSP SMSA population of white females, 1970.

Mantel-Haenszel Summary Chi-Square Values and  $P$ -Values

| Comparison                     | CHI-SQUARE    |                        | $P$ -VALUE     |                        |
|--------------------------------|---------------|------------------------|----------------|------------------------|
|                                | Breast Cancer | All Cancers<br>Females | Breast Cancer  | All Cancers<br>Females |
| St. Louis Park vs Edina        | 3.38          | 19.90                  | .05 < $p$ < .1 | < .0005                |
| St. Louis Park vs<br>Richfield | 10.85         | 21.18                  | .001           | < .0005                |
| St. Louis Park vs SMSA         | 13.64         | 24.31                  | < .0005        | < .0005                |

#### Acknowledgment

We gratefully acknowledge the advice and assistance of Marcus Kjelsberg, Ph.D., Chairman, Division of Biometry and of Leonard Schuman, M.D., M.S., Chairman, and Jack Mandel, M.P.H., Assistant Director, Division of Epidemiology, University of

Minnesota School of Public Health, Minneapolis, Minnesota. Dr. Schuman was Director of the Minneapolis-St. Paul Component of the Third National Cancer Survey, and kindly provided access to the data.

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- 14-28. May be secured from the author.

#### MMA Annual Meeting, May 20-22, 1981

##### "Common Medical Experiences"

Radisson South Hotel, Bloomington

"Common Medical Experiences" is the theme selected by the Subcommittee on Scientific Assembly for this year's scientific program. Physicians from all parts of the state, representing multiple specialties, will convene in Minneapolis May 20-22, 1981; mark your calendars now.

Participants in the scientific program will explore from various viewpoints problems and experiences which are common to diverse groups of physicians. Over 25 courses will cover topics with wide appeal. Presentations will be made by a multispecialty faculty representing various institutions and locations in the state. There will be ample time for audience-faculty interaction.

Among the many opportunities offered at the MMA Annual Meeting are fellowship with colleagues, discussions of clinical concerns and consideration of issues facing organized medicine.

Watch for further information in future issues.

Questions? Contact: Department of CME & Program Services  
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#### Cover Photograph

##### "Winter's North Shore"

Dr. Earl C. Henrikson takes an annual trip to the North Shore with the Minneapolis Chapter of the Audubon Society. The members of the Society check the winter birds as well as the boundaries of the lake shore, trails, and streams. It was during one of these trips that the cover photograph was taken.

Dr. Henrikson is a Minneapolis surgeon and has been a yearly contributor to the covers of MINNESOTA MEDICINE. His cover "Waiting for Breakfast" (November, 1978 issue of MINNESOTA MEDICINE) won the Outstanding Cover Award.